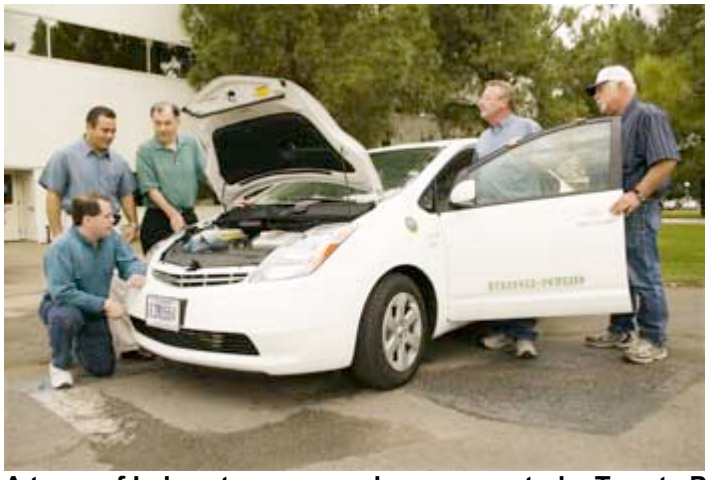
LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: Aug. 18-25, 2008.

CNN features LLNL's hydrogen car



A team of Laboratory researchers converted a Toyota Prius to run on a Livermore-designed hydrogen storage system. Left to right: Gene Berry, Francisco Espinosa-Loza, Salvador Aceves, Tim Ross and Vern Switzer.

CNN's feature program "The Next Big Thing" recently aired a piece on the Laboratory's hydrogen-powered Toyota Prius.

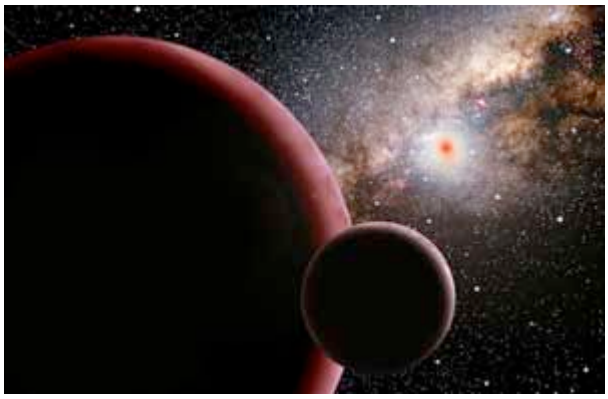
A team of Laboratory researchers designed a hydrogen storage system for the Prius. At low speeds, the auto operates on electricity; at higher speeds the car runs on liquid hydrogen.

Unlike conventional liquid hydrogen tanks in prototype cars, the LLNL pressure vessel was parked for six days without venting evaporated hydrogen vapor.

The LLNL development has significantly increased the amount of time it takes to start releasing hydrogen during periods of long-term parking, as compared to today's liquid hydrogen tanks capable of holding hydrogen for merely two to four days.

To see the CNN story, go to
https://publicaffairs.llnl.gov/news/llnl_reports/cnn_hydrogen-car21aug2008.mov

Putting the squeeze on ‘super Earth’ planets



By using a high-power laser to dynamically compress materials to high pressures, scientists have developed a new technique to identify phase transitions that may one day reveal the interior structure of "super Earth" planets that are several times larger than our own.

Phase transition kinetics are the time-dependent changes that materials undergo when transforming from one structure to another, whether it's a gas, liquid, solid or plasma.

Using one beam of Livermore’s Janus laser, Raymond Smith of the Physical Sciences Directorate and colleagues launched a ramp-compression wave lasting several nanoseconds against a bismuth sample and measured the tell-tale signature of a structural phase transformation.

"We will use this technique to map out regions of structural phase space of materials within these planets," Smith said. "This information will be critical for our understanding of how these planets were formed and evolve."

For more information, go to
https://newsline.llnl.gov/articles/2008/aug/08.22.08_super.php

LLNL‘s James Jones returns from duty in Iraq

James Jones (left) presents Mike Dunning, B Division/Program leader with a T-shirt and other mementos from his tour of duty in Iraq.

James Jones, a firing tank operator in the Lab‘s B Division High Explosives Application Facility (HEAF) recently returned from a 13-month tour of duty with the California National Guard in Iraq.

Last week, during an informal ceremony with his co-workers, Jones presented a certificate and flag, along with a T-shirt and hat to Mike Dunning, B Division/program leader, in recognition and appreciation for the support he and other soldiers received and the many care packages sent to them by HEAF personnel during his tour.

Jones presented the flag that was flown over Camp Taji, Iraq, where he was stationed last year, on the sixth anniversary of the Sept. 11 attack in memory of those who died.

Postdoc‘s research on plutonium published

Chris Marianetti

Plutonium is an element, central to national security, both in energy production

and defense. Despite almost a half century of research, plutonium remains a fundamental problem of condensed matter physics.

This topic is explored further in a paper authored by Chris Marianetti, a postdoc in Chemistry, Materials, Earth and Life Sciences (CMELS). The paper is featured in *Physical Review Letters* this month.

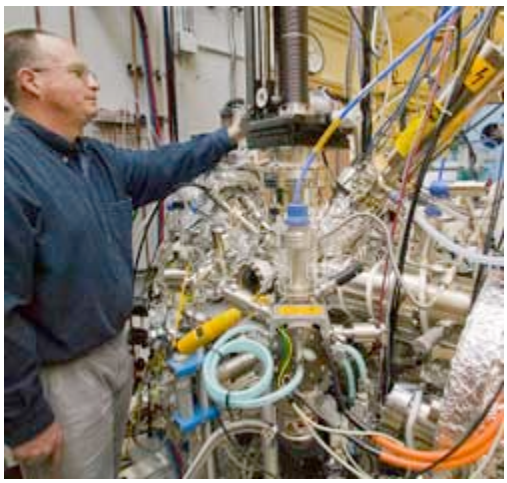
“The paper describes how we have performed one of the most accurate simulations to date of the electrons in solid plutonium (Pu) using the Dynamical Mean-Field Theory and Density Functional Theory,” Marianetti said.

The study shows that the electrons in plutonium are delocalized, but are somewhat heavy due to their interactions. The behavior of the electrons was then studied as the volume of the Pu lattice was expanded, a feat that is not easily achieved under controlled experimental conditions, Marianetti explains.

“The success of this study is simply the beginning of a much longer journey of discovery,” Marianetti said.

For more information, go to http://scitation.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=PRLTAO00010100000505640300000 1&idtype=cvips&prog=normal

Photo of the week



Unraveling plutonium mysteries -- Jim Tobin and his team in the Lab’s Materials Science and Technology division is using the Lab-made Fano

detector in a series of experiments to figure out the electron correlation of plutonium.

Photo by Jacqueline McBride/LLNL

LLNL is managed by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy's National Nuclear Security Administration.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The Livermore Lab Report archive, including today's issue, is available at: https://publicaffairs.llnl.gov/news/lab_report/2008index.html